LWG
LOWER WILLAMETTE GROUP

Chairperson: Bob Wyatt, NW Natural
Treasurer: Frederick Wolf, DBA, Legacy Site Services for Arkema

January 13, 2011

Chip Humphrey
U.S. Environmental Protection Agency, Region 10
805 SW Broadway, Suite 500
Portland, OR 97205

Re: December 9, 2010 Natural Resources Trustee Council FS Habitat Values Letter (Lower Willamette River, Portland Harbor Superfund Site, USEPA Docket No: CERCLA-10-2001-0240)

Erin and Trustee Council:

I am writing in response to your letter of December 9 requesting information on the habitat equivalency value ranges that the LWG intends to use for purposes of estimating costs of remedial alternatives in the Feasibility Study. This information was previously conveyed to Rob Neely on July 8, 2010, and a copy of that communication is enclosed.

Although subject to continuing refinement as the LWG prepares the draft Clean Water Act 404 analysis, these generally are the habitat value ranges that the LWG is planning to apply to determine potential mitigation costs for the screening of alternatives in the Feasibility Study. Any updates to the habitat values and/or the mitigation matrix framework made during development of the 404 analysis will be incorporated into the draft biological assessment as part of the proposed action to evaluate the impacts to listed species and critical habitat PCEs. The Feasibility Study, in turn, will rely on the conclusions of the draft biological assessment and the 404 analysis. The attached documents also provided the rationale for the use of the ranges, in the context of our previous discussion with NOAA on these issues.

Sincerely,

Bob Wyatt

cc: Confederated Tribes and Bands of the Yakama Nation
Confederated Tribes of the Grand Ronde Community of Oregon
Confederated Tribes of Siletz Indians of Oregon

Confederated Tribes of the Umatilla Indian Reservation
Confederated Tribes of the Warm Springs Reservation of Oregon
Nez Perce Tribe
Oregon Department of Fish & Wildlife
United States Fish & Wildlife
Oregon Department of Environmental Quality
LWG Legal
LWG Repository

Attachments
2010-07-08 Email Prep for next FS matrix meeting
LWG Technical Issues for Habitat Value Table 2010Jul8
2010-06-22 LWG Updated Habitat Values Ranges Clean exec approved
2010-06-22 Draft LWG Mitigation Framework

From:	Elizabeth Appy
To:	Robert Neely
Cc:	Megan Callahan-Grant; Genevieve Angle; Jennifer Woronets; Tom Schadt; Valerie Oster
Subject:	RE: Prep for next FS matrix meeting
Date:	Thursday, July 08, 2010 12:07:03 PM
Attachments:	LWG Technical Issues for Habitat Value Table 2010Jul8.pdf 2010-06-22 LWG Updated Habitat Values Ranges Clean exec approved.pdf 2010-06-22 Draft LWG Mitigation Framework.PDF

Hi Rob,

Thanks for your patience. As we discussed during our last meeting on June 22nd, attached are the following items for consideration prior to our next meeting (yet to be scheduled):

- List of technical issues to go along with the habitat value table. This is the list we agreed to provide to help focus the review of the proposed habitat value table updates.
- LWG-updated habitat values. This is the table that we handed out at the meeting that incorporates ranges for key habitat categories.
- Mitigation framework. This is the matrix that was also handed out at the meeting. There are no values calculated in the matrix due to the proposal to use ranges and the resulting complexity of showing all possible combinations.

Elizabeth

Elizabeth Appy
ANCHOR QEA, LLC
eappy@anchorqea.com
PO Box 2326
McKinleyville, CA 95519
T 707.633.6094
C 503.460.7504
www.anchorqea.com

-----Original Message-----
From: Robert Neely [mailto:Robert.Neely@noaa.gov]
Sent: Wednesday, June 30, 2010 10:41 AM
To: Tom Schadt; Elizabeth Appy
Cc: Megan Callahan-Grant; Genevieve Angle; Jennifer Woronets
Subject: Prep for next FS matrix meeting

Hey Tom and Elisabeth,

Hope you're well. We're wondering about the materials LWG developed for our last our last meeting (with the adjusted values, etc.). I believe they were going to be distributed to us so that we could consider them a bit more closely prior to our next meeting. Am I correct? An update would be appreciated. Assuming we'll see you next week.

R

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Robert Neely
Regional Resources Coordinator
NOAA Office of Response and Restoration
(206)526-6617 Office
(206)617-5443 Mobile

Follow up from LWG/NMFS/EPA Mitigation Matrix Meeting (June 22, 2010)

Habitat Values Table

During the June 22, 2010 Mitigation Matrix Meeting between the Lower Willamette Group (LWG), National Marine Fisheries Service (NMFS), and U.S. Environmental Protection Agency (EPA), the LWG proposed an approach to allow for a range of relative habitat values for some habitat categories to be used to determine potential Clean Water Act (CWA) Section 404 mitigation offsets related to remedial alternatives being evaluated in the Feasibility Study (FS). At the end of the meeting, the LWG agreed to identify a list of direct issues and/or questions for consideration by NMFS.

<u>Policy/Framework Comments</u>:

The LWG believes that the opportunities for implementing meaningful and cost-effective habitat improvements within Portland Harbor are limited. The LWG also believes that the mitigation framework offers a good opportunity to provide incentives for habitat improvement along many reaches of the Willamette River. The habitat values provided by NMFS offer a solid starting point for developing the mitigation framework; however, some of the fixed values put forth by NMFS offer little or no incentives for improving habitat and could preclude consideration of remedial alternatives that attempt to jointly optimize remediation and habitat benefits. The LWG believes the net result could be that few on-site opportunities for habitat improvement would be implemented given the current values, and that nearly all of the mitigation would be provided at a few off-site or off-channel locations, leaving the majority of the site with the same habitat that currently exists, in some cases, with an even lower value habitat. The LWG worries that this will not further recovery of Endangered Species Act (ESA) -listed species in the Willamette River.

<u>Comment 1</u>:

Early engagement of NMFS should assist EPA and the LWG in the development of the alternatives to be evaluated in the FS, with the habitat matrix providing the framework to satisfy CWA 404 requirements for mitigation with respect to those alternatives. After the development of the FS, EPA and NMFS will have the opportunity to evaluate the application of the matrix to the project as a whole to ensure compliance with ESA.

Comment 2:

The LWG recognizes that more discussion may be needed to ensure that the relative values between habitat types will correctly create the right balance of incentives for the harbor. The LWG believes that early involvement of NMFS and input from NMFS into the FS will be beneficial in this regard.

LWG Clarifications and Perspectives

The LWG has developed the following responses as requested by NMFS to clarify the technical discussion that occurred on June 22, 2010.

LWG Supports the Concept of Habitat Ranges for Two Reasons:

1. From a scientific perspective, the relationship between quantity and quality of habitat, and fish production and productivity is inherently uncertain. The scientifically appropriate way to capture this uncertainty is to use a range of habitat values.
2. From a policy perspective, using a range of habitat values encourages site-by-site evaluation of habitat function and encourages site-specific efforts to achieve the highest possible on-site mitigation value. An example of how the values will be used in the matrix to determine potential acres of mitigation debit or credit for evaluation in the FS is provided at the end of page 2 of the "LWG Comments on the NOAA/NMFS Habitat Values for Salmonids" meeting handout.

LWG Has Evaluated the Portland Harbor Habitat Opportunity and Found it Limited: The LWG believes that the habitat opportunities in Portland Harbor are very limited and that incentives to use on-site opportunities are an important element of the overall goal of improving habitat.

LWG Supports the Use of Riparian—Vegetated Riprap (and Bioengineering Treatments) and Believes these Treatments Should Be Encouraged through Appropriate Valuation: Under the current framework, a complex vegetated riparian slope that incorporates riprap to ensure slope stability and isolation of contaminated soils would be rated very low (0.05). Further, the current framework for riparian habitat does not include any bioengineered treatments, and the current footnoted definition of bioengineering (applicable only to the active channel margin habitat) would not include any treatment where any inert materials were the primary means of stabilizing the cap or the bank itself. Given this value and these definitions, in circumstances where contamination in a riparian area needs to be capped to ensure protectiveness, it is highly unlikely that any Potentially Responsible Party (PRP) would invest in vegetation as part of that remedial action. The result is likely to be a lack of vegetation along the remediated shorelines of Portland Harbor. The LWG proposed values and expanded definitions would allow for a range of values to account for the resulting characteristics (i.e., resulting habitat value) of the vegetated riprap or bioengineering and provide an incentive to create habitat. The lower and upper bounds of the range were defined as follows:

- 0.05 – few species and vegetation layers (e.g., shrubs with no trees) and low stem densities and canopy cover.
- 0.5 – complex layers with multiple species (e.g., ground cover, shrubs, and trees) and high stem density and canopy cover.

LWG Recognizes the Need For Bioengineered Shoreline Treatment within the Active Channel Margin and Believes these Treatments Should be Encouraged through Appropriate Valuation: Within Portland Harbor there is a zone located from the U.S. Amry Corps of Engineers (USACE) -defined Ordinary High Water (OHW) line to about 3 feet below (typically 10 to 20 feet wide) that can support woody vegetation. The LWG sees this zone as an important opportunity to provide high-flow refuge habitat within the designated critical habitat for the juveniles of several species of ESA-listed salmonids. This zone is also subject to erosion and, therefore, riprap or other rock is expected to be needed as part of many remedial actions to hold the caps in place to ensure that contaminant pathways to the aquatic system are cut off. The current NMFS-updated habitat values table would assign a value of 0 to any action that included riprap and a value of 0.2 for a bioengineered solution which, under the current definition, could not include any treatment where any inert materials were the primary means of stabilizing a protective cap, something not likely to be deemed protective given the expected range of hydrodynamic forces within Portland Harbor. Similar to the situation with riparian vegetation, given these low values, it is highly unlikely that any PRP would invest in bioengineering, nor would vegetation be incorporated into an area that also functions as a cap. The LWG believes that if the resulting riparian area is shown through monitoring to include complex layers with multiple species, high stem density, and canopy cover that functions similarly to a naturally vegetated shoreline, it should result in a habitat value that is similar to a naturally vegetated shoreline. The LWG-proposed values allow for a range to account for the resulting function of the bioengineered shoreline with the lower and upper bounds of the range defined as follows:

- 0.2— few species and vegetation layers (e.g., shrubs with no trees) and low stem densities and canopy cover.
- 0.8—complex layers with multiple species (e.g., ground cover, shrubs, and trees) and high stem density and canopy cover.

The LWG believes that vegetation should be encouraged within the active channel margin and that it could contribute to salmon habitat improvement even it if entails the use of riprap or other inert materials to provide structure.

Active Channel Margin – Definition of Vegetated Shorelines (with either <5:1 slopes or >5:1 slopes): In the NMFS ESA habitat value table, vegetated (natives) shorelines in the active channel margin for slopes less than and greater than 5:1 have relative habitat values ranging from 0.8 to 1.0 (if vegetated with invasive species, values range from 0.7 to 0.9). In Portland Harbor, it is possible to have an existing shoreline that is vegetated with grasses and scattered native species, as well as a shoreline that is vegetated with mature trees and shrubs that are continuous across the length of the shoreline. Both of these conditions could be considered vegetated, yet they provide different degrees of habitat function. Under the NMFS version of the habitat value table, both of these conditions could receive the same value. The LWG proposes a range of values based on the degree to which the shoreline is vegetated to account for these differences, as specifically described in the "LWG Justification" column of the table.

Active Channel Margin and Main Channel – Definition of "Unarmored": Based on our discussion, it is LWG's understanding that gravel (<64 mm) that is placed on top of the cap armor (riprap) <u>and</u> demonstrated to be stable or dynamically stable in a manner similar to native substrate, will be considered "unarmored." Additionally, LWG wants to confirm that placement of sand and gravel (<64 mm) material in a dredged area to return to existing grade is also considered "unarmored."

The LWG Believes that Habitat Values Need to Be Applied Consistently: In the NMFS habitat value table, values are not applied consistently for both debits and credits. The LWG believes that the habitat values need to be applied consistently whether as a debit (impact) or a credit (mitigation). One note at the bottom of the table indicates that, "credit for simply removing pilings is limited to 0.1 and for removing covering structures is limited to 0.5." This is a good example of where the debit associated with the impact is larger than the credit. If covering structures or pilings are assumed to result in large reductions in functions, then their removal must result in the same magnitude of benefit. Similarly, although the NMFS table notes indicate that no credit will be given for any new habitat with riprap or covered structures, the table applies debits if such habitat is impacted.

A Note at the Bottom of the Table Indicates that "Debits and credits for a given project need to come from the same habitat category (eg. main channel), unless credits come from creating off channel habitat because it is a primary limiting factor for salmonids.": The relative habitat values are all scaled to an "ideal" habitat condition, such that differences due to habitat categories are already accounted for in a Habitat Equivalency Analysis (HEA). The NMFS approach of constraining the use of credits seriously hinders the HEA and sets up a very different credit process between mitigation and the Natural Resource Damage (NRD) settlement.

A Note at the Bottom of the Table Indicates that "For ESA purposes, shallow water habitat is defined as <20 feet of water depth as measured at the ordinary low water elevation.": During the meeting we discussed the LWG proposal to divide the shallow water category into two subcategories—0 to 10 feet of water depth from OLW and 10 to 20 feet of water depth—and place a higher value on the 0 to 10 feet of water depth from OLW. The higher value for salmonids between 0 and 10 feet of water depth is supported by results of studies conducted on the Lower Willamette and Columbia Rivers. Specifically, Oregon Department of Fish and Wildlife (ODFW 2005) found that catches of juvenile salmonids were generally higher at sites with shallow depths between 0 and 3 meters (10 feet) than at deeper depths. In addition, a number of studies have shown that salmon fry and fingerlings often remain in water depths between approximately 10 centimeters and 2 meters (6.6 feet) (NMFS 2005).

References

NMFS (National Marine Fisheries Service). 2005. Salmon at River's End: The Role of the Estuary in the Decline and Recovery of Columbia River Salmon. NOAA Technical Memorandum NMFS-NWFSC-68. August 2005.

ODFW (Oregon Department of Fish and Wildlife). 2005. Biology, Behavior, and Resources of Resident and Anadromous Fish in the Lower Willamette River, Final Report of Research, 2000-2004. Edited by Thomas Friesen, ODFW. Prepared for City of Portland Bureau of Environmental Services, Endangered Species Act Program.

LWG Comments on the NOAA/NMFS Habitat Values for Salmonids

A mitigation matrix is being developed in order to determine the mitigation requirements under Section 404 of the Clean Water Act (CWA) as well as provide a common basis for expected mitigation requirements for analyzing alternatives in the Feasibility Study (FS) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. In addition, the mitigation activities also provide benefits under the ESA to listed species and critical habitat. Relative habitat values developed for juvenile Chinook salmon by an expert panel for Natural Resource Damage (NRD) purposes ("Expert panel Chinook salmon values"), an updated table presented by NMFS to include additional life stages and listed species ("NMFS salmonid values"), and other available scientific information are being used to develop relative habitat values as an input into the mitigation matrix. The matrix will help determine mitigation ratios that will result from implementing specific remedial activities.

In considering habitats in the Portland Harbor Superfund Site (Superfund Site), the LWG believes a range of values is necessary to capture the variability in certain habitat categories based on site-specific characteristics. For example, vegetated banks may include some invasive species and some natives. The value for a "vegetated bank, invasive" would therefore vary based on the percent cover of invasive species as compared to percent cover of natives. This approach also recognizes the natural variability that exists within the Superfund Site and is consistent with the Willamette Partnership's Counting on the Environment salmon calculator methodology (http://willamettepartnership.org/ecosystem-credit-accounting/salmon-habitat) because it takes into account the fact that not all habitat types are equal in terms of habitat function. This methodology was developed in part by a salmonid focus group convened by The Willamette Partnership's Counting on the Environment program, which has been supported by 27 state and federal natural resource management agencies and other non-profit stakeholders, including the State of Oregon, NRCS, Oregon Department of Transportation, U.S. Forest Service, EPA, Oregon Watershed Enhancement Board, Defenders of Wildlife, City of Albany, Oregon Department of Agriculture, Oregon Department of Forestry, Oregon Department of State Lands, Oregon Department of Environmental Quality, Oregon Department of Fish and Wildlife, Clean Water Services, Institute for Natural Resources, Mud Slough Wetland Mitigation Bank, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, City of Eugene, Ecotrust, the Nature Conservancy, The Freshwater Trust, and Willamette Partnership.

To demonstrate the need for a range of values, a few examples are noted. Not all existing vegetated slopes provide actual habitat value that falls in the range of 0.8 to 1.0, as suggested by the NMFS salmonid values. To better assess the ecological function provided by an existing slope, its vegetation layers and species richness should be assessed, rather than solely its classification as "vegetated". Furthermore, a low value for bioengineered slopes may be appropriate for some low intensity bioengineering applications that yield few species or vegetation layers (e.g., shrubs with no trees). However, more intense bioengineering applications can yield complex vegetation canopies with many layers (e.g., ground cover, shrubs, and trees) and provide functions that are similar to naturally vegetated slopes. Such bioengineering designs may provide high value even if rock is incorporated. For in-water habitat types, substrate size smaller than sand/gravel may not be indicative of productive habitat that is valued as a 1. Some fine substrates may not support a fully functional benthic community and therefore may not provide as productive, high value habitats to salmonids. Unnatural, anthropogenic debris may also compromise shallow water habitats with otherwise suitable substrates, thereby decreasing the existing value of the habitat.

In the table below, proposed ranges of habitat values have been added for certain habitat categories under the "LWG-proposed values for salmonids" column along with a justification for the range. These ranges are provided in order to account for the variability in habitat categories. The relative habitat values refer to habitats within a given category (i.e., riparian, active channel margin, etc) and are specific to migratory salmonids. The values reflect relative value of the habitat categories to one another. All of these values will be applied to both existing and proposed conditions as part of the application in the mitigation matrix. The habitat values will be used in the mitigation matrix to identify potential mitigation requirements (debits or credits) resulting from the implementation of a remedial technology as follows:

Acres of mitigation debit (-) or credit (+) = (Proposed habitat value – Existing habitat value) * Acres of impacted habitat

- An example of how the values will be used in the matrix to determine potential acres of mitigation debit or credit for evaluation in the FS is provided below. Assume capping with a surface layer of riprap armor is an alternative proposed over one acre of an active channel margin.
- Assume the existing slope is steep (>5:1), unarmored, and vegetated with native species. The relative habitat value for this condition (using the LWG proposed values) ranges from 0.2 to 0.8 depending on vegetative complexity (i.e., layers), species richness, stem densities, canopy cover, and steepness of the slope.
- Assume the proposed slope will also be steep (>5:1) and will be armored with riprap over the 1-acre area that the cap is proposed. The relative habitat value for this condition (using the LWG proposed values) is 0.1 since the slope would remain steep and the density of riprap would be high with minimal areas of natural substrate.
- For the FS, no surveys to determine the complexity of the vegetation, species richness, stem densities, or canopy cover will be performed. As such, the potential mitigation debit/credit will result in a range to account for the varying existing conditions that could occur in the Superfund Site. Using the equation above to account for both ends of the range of existing conditions, the potential acres of mitigation debit would range from -0.1 to -0.7.

Habitat	Habitat Characteristics	Expert Panel Chinook Salmon Value	NMFS Salmonid Value	LWG-Proposed Values for Salmonids	LWG Justification
Riparian	Naturally vegetated forest, <400 ft from ACM[1, 2]	0.5	0.5	0.5	No proposed change
	and in the historic floodplain	0.65	0.65	0.65	No proposed change
	Naturally vegetated, grass/shrub	0.2	0.2	0.2	No proposed change
	and associated with historic floodplain	0.35	0.35	0.35	No proposed change
	Invasive species[3]	0.1	0.1	0.1 – 0.3	Based on level of establishment of invasive community vs. remaining natives, range from mostly invasive (0.1) to 50% (by cover) invasive species (0.3)
	Vegetated riprap and bioengineering treatments	No value provided	0.05	0.05 – 0.5	Based on the complexity of vegetation layers, species richness, stem densities, and canopy cover. Range from few species and vegetation layers (e.g., shrubs with no trees), and low stem density and canopy cover (0.05) to complex layers with multiple species (e.g., ground cover, shrubs, and trees) high stem density and canopy cover that provide functions similar to natural habitat (0.5).
	Unvegetated/paved/buildings/riprap	No value provided	0	0	No proposed change
Active Channel Margin	Sloped (<5:1), unarmored and vegetated[4]	1	1	0.4 – 1	Based on vegetative complexity (i.e., layers) and species richness, stem densities, and canopy cover. Range from few species and vegetation layers (e.g., shrubs with no trees), and low stem density and canopy cover (0.4) to complex layers with multiple species (e.g., ground cover, shrubs, and trees) high stem density and canopy cover that provide functions similar to natural habitat (1). "Unarmored" includes situations where sand and gravel substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).

Habitat	Habitat Characteristics	Expert Panel Chinook Salmon Value	NMFS Salmonid Value	LWG-Proposed Values for Salmonids	LWG Justification
	Sloped (>5:1), unarmored and vegetated[4]	0.2	0.8	0.2 - 0.8	Based on vegetative complexity (i.e., layers), species richness, stem densities, canopy cover, and steepness of the slope. Range from few vegetation layers (e.g., shrubs with no trees) and species, low stem density and canopy cover with very steep slope (>3:1) (0.2) to multiple vegetation layers and species, high stem density and canopy cover with less steep slope (<3:1 and >5:1) (0.8). "Unarmored" includes situations where sand and gravel substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).
	Sloped (>5:1), unarmored and vegetated with invasives			0.1 – 0.6	Based on level of establishment of invasive community vs. remaining natives, and steepness of the slope. Range from mostly invasive with steep slope (>3:1) (0.1) to 50% (by cover) invasive species with less steep slope (<3:1 and >5:1) (0.6). "Unarmored" includes situations where sand and gravel substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).
	Sloped (<5:1), unarmored and unvegetated	0.8	0.8	0.2 - 0.8	Based on varying substrate conditions associated with the slope—i.e., sand/gravel (0.8) to larger rock (0.2). "Unarmored" includes situations where sand and gravel substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).
	Sloped (>5:1), unarmored and unvegetated		0.1	0.1 – 0.3	Based on slope stability; range from eroding shoreline (0.1) to a more stable shoreline (0.3). "Unarmored" includes situations where sand and gravel substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).

Habitat	Habitat Characteristics	Expert Panel Chinook Salmon Value	NMFS Salmonid Value	LWG-Proposed Values for Salmonids	LWG Justification
	Sloped (<5:1), bio-engineered	0.4	0.2	0.2 – 0.8	Based on vegetation complexity (i.e., layers), species richness, stem densities, canopy cover, and steepness of the slope. Range from few species or vegetation layers (e.g., shrubs with no trees), low stem density and canopy cover (0.2) to complex layers with multiple species (e.g., ground cover, shrubs, and trees), high stem density and canopy cover, that provide functions similar to natural habitat (0.8).
	Sloped (>5:1), bio-engineered	0.2	0.2	0.2 – 0.8	Based on vegetation complexity (i.e., layers), species richness, stem densities, canopy cover, and steepness of the slope, range from few species or vegetation layers (e.g., shrubs with no trees), low stem density and canopy cover with a very steep slope (>3:1)(0.2) to complex layers with multiple species (e.g., ground cover, shrubs, and trees), high stem densities and canopy cover that provide functions similar to natural habitat with a less steep slope (<3:1 and >5:1) (0.8).
	Riprap, concrete, or other artificial debris	0.1	0	0.1 – 0.3	Riprap in the active channel margin that is inundated provides some, although very limited, habitat value to salmonids. Values depend on density of the riprap, concrete, or other artificial debris. Range from low density where areas of natural substrate are frequent (0.3) to high density with minimal areas of natural substrate (0.1).
	Sheetpile	0	0	0	No proposed change
	Pilings (1 per 100 square feet)	½ value of margin type	½ value of margin type	½ value of margin type	No proposed change other than this value should apply for debits as well as credits (see LWG comment on NMFS Notes at end of the table).
	Covered structures over channel margins[5]	Max. of 0.1	0.1	½ value of the margin type	Based on the Notes at the bottom of the page that will allow for a maximum of 0.5 credit for removal of covered structures (0.5 is ½ of the highest valued habitat type).

Habitat	Habitat Characteristics	Expert Panel Chinook Salmon Value	NMFS Salmonid Value	LWG-Proposed Values for Salmonids	LWG Justification
Main channel	Shallow water, gravel and finer substrates • 0 to 10 feet of water depth from OLW • 10 to 20 feet of water depth from OLW	1	1	0.8 – 1 0.4	Based on substrate variability in the 0 to 10 feet of water depth from OLW zone; Finer, muddy substrates may not support productive benthic community, thereby reducing value. Variability in the 10 to 20 feet of water depth from OLW is more limited. This includes situations where sand and gravel substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).
	Shallow water, natural rock outcrop[6] • 0 to 10 feet of water depth from OLW • 10 to 20 feet of water depth from OLW	1	1	0.8 – 1 0.3	Natural rock outcrop could be in the vicinity of variable substrate conditions as described above for shallow water, gravel and finer substrates.
	Shallow water, moderate substrate size (rounded rock larger than sand/gravel, but smaller than riprap) • 0 to 10 feet of water depth from OLW • 10 to 20 feet of water depth from OLW			0.4 – 0.6 0.2	Values depend on density of the moderate substrate size. Range from low density where areas of smaller sand/gravel substrate are frequent (0.6) to high density with minimal areas of smaller sized substrate (0.4). This includes situations where moderate size substrate is either placed or deposits naturally over an engineered cap, and is stable or dynamically stable in a manner similar to the native substrate (see new footnote 9).
	Shallow water with riprap, concrete, or other artificial debris • 0 to 10 feet of water depth from OLW • 10 to 20 feet of water depth from OLW	0.1	0.1	0.1 – 0.5 0.1	Values in 0 to 10 feet of water depth depend on density of the riprap, concrete, or other artificial debris. Range from low density where areas of natural substrate are frequent (0.5) to high density with minimal areas of natural substrate (0.1).
	Shallow water with covering structures[5] • 0 to 10 feet of water depth from OLW • 10 to 20 feet of water depth from OLW	0.1	0.1	½ value of the channel type	Based on the Notes at the bottom of the page that will allow for a maximum of 0.5 credit for removal of covered structures (0.5 is ½ of the highest valued habitat type).

Habitat	Habitat Characteristics	Expert Panel Chinook Salmon Value	NMFS Salmonid Value	LWG-Proposed Values for Salmonids	LWG Justification
	shallow water with pilings (1 per 100 square feet)	0.5	½ value of channel type	½ value of channel type	No proposed change
	Deep water with natural substrates	0.1	0.1	0.1	No proposed change
	Deep water with artificial substrates	0.05	0.05	0.05	No proposed change
	“Cold” water tributary	1	1	1	No proposed change
Off channel	"Warm" water tributary	0.9	0.9	0.9	No proposed change
	Side channel	1	1	1	No proposed change
	Alcove or slough with tributary	1	1 [7]	1 [7]	No proposed change
	Alcove or slough without tributary	0.8	0.8	0.8	No proposed change
	Embayment (cove) with tributary	1	1 [7]	1 [7]	No proposed change
	Embayment (cove) without tributary	0.8	0.8[8]	0.8[8]	No proposed change

Notes:
1 ACM = active channel margin
2 Achieves 80% of full function within 10 years; this time is adequate because of flood protection
3 e.g., Himalayan blackberry
4 Native species
5 e.g., docks
6 Cannot be created
7 Value is 0.9 for salmonid adults if "warm" water tributary
8 Value is 0.6 further upstream
9 Engineering analysis and/or monitoring is anticipated to be necessary to demonstrate that materials overlying an engineered cap persist and are available to provide the anticipated ecological function.

NMFS NOTES

-Debits and credits for a given project need to come from the same habitat category (eg. main channel), unless credits come from creating off channel habitat because it is a primary limiting factor for salmonids.

LWG COMMENT: Debits and credits should be transferable between habitat types. The primary value of a HEA approach is the conversion of credits and debits into a currency that can be applied between habitat types and provides incentive for creative mitigation.

-No credit will be given for creating any new habitat with riprap, artificial substrates, pilings or covering structures.

LWG COMMENT: Values should be applied consistently whether as a debit (impact) or a credit (mitigation).

- Credit for simply removing pilings is limited to 0.1 and for removing covering structures is limited to 0.5.

LWG COMMENT: Values should be applied consistently whether as a debit (impact) or a credit (mitigation). If covering structures or pilings are assumed to result in large reductions in functions, then their removal must result in the same magnitude of benefit.

-For ESA purposes, shallow water habitat is defined as <20 feet of water depth as measured at the ordinary low water elevation.

LWG Comment: Shallow water is defined as 20 feet of water depth from OLW and updated values place a higher value on the 0-10 feet of water depth from OLW. The higher value for salmonids between 0 and 10 feet of water depth is supported by results of studies conducted on the Lower Willamette and Columbia Rivers. Specifically, ODFW (2005) found that catches of juvenile salmonids were generally higher at sites with shallow depths between 0 and 3 meters (10 feet) than at deeper depths. In addition, a number of studies have shown that salmon fry and fingerlings often remain in water depths between approximately 10 centimeters and 2 meters (6.6 feet) (NMFS 2005).

Oregon Department of Fish and Wildlife (ODFW). 2005. Biology, Behavior, and Resources of Resident and Anadromous Fish in the Lower Willamette River, Final Report of Research, 2000-2004. Edited by Thomas Friesen, ODFW. Prepared for City of Portland Bureau of Environmental Services, Endangered Species Act Program.

NMFS. 2005b. Salmon at River's End: The Role of the Estuary in the Decline and Recovery of Columbia River Salmon. NOAA Technical Memorandum NMFS-NWFSC-68. August 2005.

- Bio-engineering is defined as the use of living and nonliving plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction, and vegetative establishment. To receive credit for bio-engineered ACM, the treatments may include inert components and grading but they must fundamentally rely on riparian plants to provide long term strength to the bank. Inert material may be used but generally only to temporarily reduce hydraulic pressures so that the planted live material can become established. NMFS must appove any proposal for bio-engineered ACM for credit to be given.

LWG Comment: The LWG does not agree with this definition of bio-engineering, but it is less important if we focus on the true characteristics of a site, rather than categories.

Table 1. Draft LWG Mitigation Framework[a] - Active Channel Margin

Remedial Technologies	Active Channel Margin																					
	Sloped (<5:1), unarmored and vegetated (native)[q] (0.4 - 1)	Note ID	Sloped (<5:1), unarmored and unvegetated (0.2 - 0.8)[q]	Note ID	Sloped (>5:1), unarmored and vegetated (native)[q] (0.2 - 0.8)	Note ID	Sloped (>5:1) unarmored and vegetated with invasives (0.1 - 0.6)[o, q]	Note ID	Sloped (<5:1), bio-engineered[q] (0.2 - 0.8)	Note ID	Sloped (>5:1), bio-engineered (0.2 - 0.8)	Note ID	Sloped (>5:1) unarmored and unvegetated (0.1 - 0.3)	Note ID	Covered structures over channel margins (docks) (1/2 value of the margin type)	Note ID	Riprap Concrete or other artificial debris (0.1 - 0.3)	Note ID	Sheetpile (0)	Note ID	Pilings (1 per 100 sq ft) (1/2 value of margin type)	Note ID
Dredging																						
Dredging resulting in a habitat type conversion to deep water (0.1)		-		-		-		o		-		-		-		-		d		d		e
Dredging **not** resulting in a habitat type conversion (may include capping back over the dredge area with similar substrate type)		-		-		-		o		-		-		-		-		-		-		-
Capping																						
Capping resulting in a **significant** change in substrate type (i.e., from silt/sand/gravel to large rock) but no change in depth zones[n]		-		-		-		o		-		-		-		-		d		d		e
Capping resulting in a **moderate** change in substrate type (i.e., from silt/sand/gravel to cobble or material size larger than gravel but smaller than riprap) but no change in depth zones[n]		k		k		k		k		d		d		d		d		k		d		e
Capping that **does not** result in a significant change in the substrate type (i.e., substrate size remains similar to existing conditions) and no change in depth zones		-		-		-		o		-		-		-		-		-		-		-
Capping that leads to a conversion of deep water to shallow water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock)[n]	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-
Capping that leads to a conversion of deep water to shallow water depths and **does not** result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock)[n]	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-
Shoreline Integration[b]																						
Shoreline integration resulting in hardening of the shoreline (i.e., placement of large rock)		f		f		f		f, o		f		f		f		f		f		d		e
Shoreline integration resulting in softening of the shoreline		g		g		g		g, o		g		g		g		-		g		g		e
Shoreline integration that **does not** result in a change in the shoreline condition		-		-		-		o		-		-		-		-		-		-		-
Enhanced Monitored Natural Recovery (includes in situ treatment)																						
Placement of sand/gravel or smaller substrate for monitored natural recovery		-		-		-		o		-		-		-		-		-		-		-
Over-water and In-water Structures																						
Removal of over-water structures that causes aquatic shading	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-		e	N/A	-	N/A	-	N/A	-
Replacement of over-water structures in a way that reduces the amount of aquatic shading by allowing light to penetrate underneath the structure and that is expected to improve habitat function	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-		-	N/A	-	N/A	-	N/A	-
Removal of existing piles that provide habitat to predators of juvenile salmonids	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		e

Table 1. Draft LWG Mitigation Framework[a] - Active Channel Margin

Remedial Technologies	Active Channel Margin																					
	Sloped (<5:1), unarmored and vegetated (native)[q] (0.4 - 1)	Note ID	Sloped (<5:1), unarmored and unvegetated (0.2 - 0.8)[q]	Note ID	Sloped (>5:1), unarmored and vegetated (native)[q] (0.2 - 0.8)	Note ID	Sloped (>5:1) unarmored and vegetated with invasives (0.1 - 0.6)[o, q]	Note ID	Sloped (<5:1), bio-engineered[q] (0.2 - 0.8)	Note ID	Sloped (>5:1), bio-engineered (0.2 - 0.8)	Note ID	Sloped (>5:1) unarmored and unvegetated (0.1 - 0.3)	Note ID	Covered structures over channel margins (docks) (1/2 value of the margin type)	Note ID	Riprap Concrete or other artificial debris (0.1 - 0.3)	Note ID	Sheetpile (0)	Note ID	Pilings (1 per 100 sq ft) (1/2 value of margin type)	Note ID
Confined Disposal Facility Construction/Confined Aquatic Disposal																						
Filling that leads to a conversion of deep water to shallower water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Filling that leads to a conversion of deep water to shallow water depths and does not result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Filling aquatic habitat that results in a conversion to upland habitat		-		-		-		o		-		-		-		-		-		-		e

Notes:

a This matrix is focused on long-term habitat impacts rather than short-term construction related impacts.The short-term construction related impacts would be dealt with using BMPs that could potentially be employed, and would not require habitat mitigation.

b Shoreline Integration = To successfully integrate a new cap or dredge slope into the shoreline, the shoreline may need to be altered; the need for dredging and capping in the river may result in the need for integration into the higher shoreline for removal or capping of contaminants in the lower shoreline.

d It is assumed that the existing habitat condition will not be further improved or degraded if left in place regardless of the proposed remedial activity. For example, sheetpile and riprap in the active channel margin have a habitat value of 0. The proposed habitat value will remain 0 regardless of what remedial activity is proposed.

e Existing or proposed habitat values depend on the habitat characteristics where the piling or covering structures are or will be located.

f Value could change depending on the type of hardening that occurs. For this table, we assumed the slope would be riprapped.

g Value could change depending on proposed type of softening. For this table we assumed a slope < 5:1 with vegetation and no armoring.

h No existing values are found in the NMFS Expert Panel Table of Relative Chinook Salmon Lower Willamette Habitat Values for hardening off-channel habitats, so the values from the active channel margin were used

i It is assumed that the riprap and covering structures habitat will not be further improved or degraded by placing piling.

k NMFS Expert Panel provided a value of 0.1 for riprap in the shallow water main channel areas. Proposing to add a value of ranging from 0.4 to 0.6 for material sized larger than gravel, but smaller than riprap.

n Sand/silt/gravel = material less than 64 mm in size

o This scenario did not have a value in the Expert Panel table.

p Value will vary depending on what the naturally vegetated habitat types will be hardened to (i.e., vegetated riprap or riprap) or on what the degraded habitat types are softened to.

q sand/gravel material overlying riprap (may need monitoring to confirm it remains in place) gets same values; Riprap with smaller material layered on top, or placed in such a way as to promote natural deposition of sediment would provide habitat value similar to those for given ACM categories

General Note - For the purposes of the FS, it is assumed that mitigation projects would be implemented within 2 years of the remedial activity and that it would take the habitat 1 year to reach full function.

Table 1. Draft LWG Mitigation Framework[a] - Main Channel

Remedial Technologies	Main Channel Shallow Water											
	Gravel and finer substrates 0 to 10 ft water from OLW (0.8 - 1)[q]	Note ID	Gravel and finer substrates 10 to 20 ft water from OLW (0.4)[q]	Note ID	Natural rock outcrop (can not be created) 0 to 10 ft water from OLW (0.8 - 1)	Note ID	Natural rock outcrop (can not be created) 10 to 20 ft water from OLW (0.3)	Note ID	Moderate substrate size (rounded rock larger than sand/gravel but smaller than riprap) 0 to 10 ft water from OLW (0.4 - 0.6)[q]	Note ID	Moderate substrate size (rounded rock larger than sand/gravel but smaller than riprap) 10 to 20 ft water from OLW (0.2)[q]	Note ID
Dredging												
Dredging resulting in a habitat type conversion to deep water		-		-	N/A	-	N/A	-		-		-
Dredging **not** resulting in a habitat type conversion (may include capping back over the dredge area with similar substrate type)		-		-	N/A	-	N/A	-		-		-
Capping												
Capping resulting in a **significant** change in substrate type (i.e., from silt/sand/gravel to large rock) but no change in depth zones [n]		-		-	N/A	-	N/A	-		-		-
Capping resulting in a **moderate** change in substrate type (i.e., from silt/sand/gravel to cobble or material size larger than gravel but smaller than riprap) but no change in depth zones [n]		k		k	N/A	-	N/A	-		k		k
Capping that **does not** result in a significant change in the substrate type (i.e., substrate size remains similar to existing conditions) and no change in depth zones		-		-	N/A	-	N/A	-		-		-
Capping that leads to a conversion of deep water to shallow water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock)[n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Capping that leads to a conversion of deep water to shallow water depths and **does not** result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Shoreline Integration[b]												
Shoreline integration resulting in hardening of the shoreline (i.e., placement of large rock)	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Shoreline integration resulting in softening of the shoreline	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Shoreline integration that **does not** result in a change in the shoreline condition	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Enhanced Monitored Natural Recovery (includes in situ treatment)												
Placement of sand/gravel or smaller substrate for monitored natural recovery		-				-						
Over-water and In-water Structures												
Removal of over-water structures that causes aquatic shading	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Replacement of over-water structures in a way that reduces the amount of aquatic shading by allowing light to penetrate underneath the structure and that is expected to improve habitat function	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Removal of existing piles that provide habitat to predators of juvenile salmonids	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-

Table 1. Draft LWG Mitigation Framework[a] - Main Channel

	Main Channel Shallow Water											
Remedial Technologies	Gravel and finer substrates 0 to 10 ft water from OLW (0.8 - 1)[q]	Note ID	Gravel and finer substrates 10 to 20 ft water from OLW (0.4)[q]	Note ID	Natural rock outcrop (can not be created) 0 to 10 ft water from OLW (0.8 - 1)	Note ID	Natural rock outcrop (can not be created) 10 to 20 ft water from OLW (0.3)	Note ID	Moderate substrate size (rounded rock larger than sand/gravel but smaller than riprap) 0 to 10 ft water from OLW (0.4 - 0.6)[q]	Note ID	Moderate substrate size (rounded rock larger than sand/gravel but smaller than riprap) 10 to 20 ft water from OLW (0.2)[q]	Note ID
Confined Disposal Facility Construction/Confined Aquatic Disposal												
Filling that leads to a conversion of deep water to shallower water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Filling that leads to a conversion of deep water to shallow water depths and does not result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Filling aquatic habitat that results in a conversion to upland habitat		-				-						

Table 1. Draft LWG Mitigation Framework[a] - Main Channel

	Main Channel Shallow Water (continued)										Main Channel Deep Water			
Remedial Technologies	Pilings (1 per 100 sq ft) (1/2 value of main channel type)	Note ID	Shallow water with riprap, concrete or other artificial debris 0 to 10 ft water from OLW (0.1 - 0.5)	Note ID	Shallow water with riprap, concrete or other artificial debris 10 to 20 ft water from OLW (0.1)	Note ID	Shallow water with covering structures (docks) 0 to 10 ft water from OLW (1/2 value of the channel type)	Note ID	Shallow water with covering structures (docks) 10 to 20 ft water from OLW (1/2 value of the channel type)	Note ID	Natural substrates (0.1)	Note ID	Artificial substrates (0.05)	Note ID
Dredging														
Dredging resulting in a habitat type conversion to deep water		e		-		-		-		-	N/A	-	N/A	-
Dredging **not** resulting in a habitat type conversion (may include capping back over the dredge area with similar substrate type)		-		-		-		-		-		-		-
Capping														
Capping resulting in a **significant** change in substrate type (i.e., from silt/sand/gravel to large rock) but no change in depth zones [n]		e		-		-		-		-		-		-
Capping resulting in a **moderate** change in substrate type (i.e., from silt/sand/gravel to cobble or material size larger than gravel but smaller than riprap) but no change in depth zones [n]		e, k		-		-		d		d		-		-
Capping that **does not** result in a significant change in the substrate type (i.e., substrate size remains similar to existing conditions) and no change in depth zones		-		-		-		-		-		-		-
Capping that leads to a conversion of deep water to shallow water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock)[n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		-		-
Capping that leads to a conversion of deep water to shallow water depths and **does not** result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		-		-
Shoreline Integration[b]														
Shoreline integration resulting in hardening of the shoreline (i.e., placement of large rock)	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Shoreline integration resulting in softening of the shoreline	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Shoreline integration that **does not** result in a change in the shoreline condition	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Enhanced Monitored Natural Recovery (includes in situ treatment)														
Placement of sand/gravel or smaller substrate for monitored natural recovery	0	-		-				-		-		-		-
Over-water and In-water Structures														
Removal of over-water structures that causes aquatic shading	N/A	-	N/A	-	N/A	-		e		e	N/A	-	N/A	-
Replacement of over-water structures in a way that reduces the amount of aquatic shading by allowing light to penetrate underneath the structure and that is expected to improve habitat function	N/A	-	N/A	-	N/A	-		-		-	N/A	-	N/A	-
Removal of existing piles that provide habitat to predators of juvenile salmonids		e	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-

Table 1. Draft LWG Mitigation Framework[a] - Main Channel

Remedial Technologies	**Main Channel Shallow Water (continued)**										**Main Channel Deep Water**			
	Pilings (1 per 100 sq ft) (1/2 value of main channel type)	Note ID	Shallow water with riprap, concrete or other artificial debris 0 to 10 ft water from OLW (0.1 - 0.5)	Note ID	Shallow water with riprap, concrete or other artificial debris 10 to 20 ft water from OLW (0.1)	Note ID	Shallow water with covering structures (docks) 0 to 10 ft water from OLW (1/2 value of the channel type)	Note ID	Shallow water with covering structures (docks) 10 to 20 ft water from OLW (1/2 value of the channel type)	Note ID	Natural substrates (0.1)	Note ID	Artificial substrates (0.05)	Note ID
Confined Disposal Facility Construction/Confined Aquatic Disposal														
Filling that leads to a conversion of deep water to shallower water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		-		-
Filling that leads to a conversion of deep water to shallow water depths and does not result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		-		-
Filling aquatic habitat that results in a conversion to upland habitat		-		-				-				-		-

Notes:

a This matrix is focused on long-term habitat impacts rather than short-term construction related impacts.The short-term construction related impacts would be dealt with using BMPs that could potentially be employed, and would not require habitat mitigation.

b Shoreline Integration = To successfully integrate a new cap or dredge slope into the shoreline, the shoreline may need to be altered; the need for dredging and capping in the river may result in the need for integration into the higher shoreline for removal or capping of contaminants in the lower shoreline.

d It is assumed that the existing habitat condition will not be further improved or degraded if left in place regardless of the proposed remedial activity. For example, sheetpile and riprap in the active channel margin have a habitat value of 0. The proposed habitat value will remain 0 regardless of what remedial activity is proposed.

e Existing or proposed habitat values depend on the habitat characteristics where the piling or covering structures are or will be located.

f Value could change depending on the type of hardening that occurs. For this table, we assumed the slope would be riprapped.

g Value could change depending on proposed type of softening. For this table we assumed a slope < 5:1 with vegetation and no armoring.

h No existing values are found in the NMFS Expert Panel Table of Relative Chinook Salmon Lower Willamette Habitat Values for hardening off-channel habitats, so the values from the active channel margin were used (i.e., riprap = 0.1)

i It is assumed that the riprap and covering structures habitat will not be further improved or degraded by placing piling.

k NMFS Expert Panel provided a value of 0.1 for riprap in the shallow water main channel areas. Proposing to add a value of ranging from 0.4 to 0.6 for material sized larger than gravel, but smaller than riprap.

n Sand/silt/gravel = material less than 64 mm in size

o This scenario did not have a value in the Expert Panel table.

p Value will vary depending on what the naturally vegetated habitat types will be hardened to (i.e., vegetated riprap or riprap) or on what the degraded habitat types are softened to.

q sand/gravel material overlying riprap (may need monitoring to confirm it remains in place) gets same values; Riprap with smaller material layered on top, or placed in such a way as to promote natural deposition of sediment would provide habitat value similar to those for the given main channel category

General Note - For the purposes of the FS, it is assumed that mitigation projects would be implemented within 2 years of the remedial activity and that it would take the habitat 1 year to reach full function.

Table 1. Draft LWG Mitigation Framework[a] - Off-channel Habitat

	Off-channel																											
Remedial Technologies	"Cold" water tributary (1)	Note ID	Side channel (1)	Note ID	Alcove or slough with "cold" tributary (1)	Note ID	Embayment (cove) with "cold" tributary (1)	Note ID	Alcove or slough with "warm" tributary (.9)	Note ID	Embayment (cove) with "warm" tributary (.9)	Note ID	"Warm" water tributary (0.9)	Note ID	Alcove or slough without tributary (0.8)	Note ID	Embayment (cove) without tributary (0.8) (0.6 if upstream)	Note ID	Bioengineered (0.2-0.8)	Note ID	Covered structures over off-channel areas (docks)(1/2 value of the channel type)	Note ID	Riprap, concrete or other artificial debris (0.1-0.3)	Note ID	Sheetpile (0)	Note ID	Pilings (1 per 100 sq ft) (1/2 value of off-channel type)	Note ID
Dredging																												
Dredging resulting in a habitat type conversion to deep water		-		-		-		-		-		-		-		-		-		-		-		d		d		e
Dredging **not** resulting in a habitat type conversion (may include capping back over the dredge area with similar substrate type)		-		-		-		-		-		-		-		-		-		-		-		-		-		-
Capping																												
Capping resulting in a **significant** change in substrate type (i.e., from silt/sand/gravel to large rock) but no change in depth zones [n]		-		-		-		-		-		-		-		-		-		-		-		-		-		e
Capping resulting in a **moderate** change in substrate type (i.e., from silt/sand/gravel to cobble or material size larger than gravel but smaller than riprap) but no change in depth zones [n]		k		k		k		k		k		k		k		k		k		d		d		-		d		e
Capping that **does not** result in a significant change in the substrate type (i.e., substrate size remains similar to existing conditions) and no change in depth zones		-		-		-		-		-		-		-		-		-		-		-		-		-		-
Capping that leads to a conversion of deep water to shallow water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock)[n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-
Capping that leads to a conversion of deep water to shallow water depths and **does not** result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-	N/A		N/A	-	N/A	-	N/A	-	N/A	-
Shoreline Integration[b]																												
Shoreline integration resulting in hardening of the shoreline (i.e., placement of large rock)		h, f		h, f		h, f		h, f		h, f		h, f		h, f		h, f		h, f		h, f		h, f		h, f		d		e
Shoreline integration resulting in softening of the shoreline	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		g		-		g		g		e
Shoreline integration that **does not** result in a change in the shoreline condition		-		-		-		-		-		-		-		-		-		-		-		-		-		-
Enhanced Monitored Natural Recovery (includes in situ treatment)																												
Placement of sand/gravel or smaller substrate for monitored natural recovery		-		-		-		-		-		-		-		-		-		-		-		-		-		-
Over-water and In-water Structures																												
Removal of over-water structures that causes aquatic shading	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		e	N/A	-	N/A	-	N/A	-
Replacement of over-water structures in a way that reduces the amount of aquatic shading by allowing light to penetrate underneath the structure and that is expected to improve habitat function	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-		-	N/A	-	N/A	-	N/A	-
Removal of existing piles that provide habitat to predators of juvenile salmonids	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-			N/A	-	N/A	-	N/A	-		e

Table 1. Draft LWG Mitigation Framework[a] - Off-channel Habitat

	Off-channel																									
Remedial Technologies	"Cold" water tributary (1)	Note ID	Side channel (1)	Note ID	Alcove or slough with "cold" tributary (1)	Note ID	Embayment (cove) with "cold" tributary (1)	Note ID	Alcove or slough with "warm" tributary (.9)	Note ID	Embayment (cove) with "warm" tributary (.9)	Note ID	"Warm" water tributary (0.9)	Note ID	Alcove or slough without tributary (0.8)	Note ID	Embayment (cove) without tributary (0.8) (0.6 if upstream)	Note ID	Bioengineered (0.2-0.8)	Note ID	Covered structures over off-channel areas (docks)(1/2 value of the channel type)	Note ID	Riprap, concrete or other artificial debris (0.1-0.3)	Note ID	Sheetpile (0)	Note ID	Pilings (1 per 100 sq ft) (1/2 value of off-channel type)	Note ID
Confined Disposal Facility Construction/Confined Aquatic Disposal																												
Filling that leads to a conversion of deep water to shallower water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Filling that leads to a conversion of deep water to shallow water depths and does not result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-	N/A	-
Filling aquatic habitat that results in a conversion to upland habitat		-		-		-		-		-		-		-		-		-		-		-		-		-		e

Notes:

a This matrix is focused on long-term habitat impacts rather than short-term construction related impacts.The short-term construction related impacts would be dealt with using BMPs that could potentially be employed, and would not require habitat mitigation.

b Shoreline Integration = To successfully integrate a new cap or dredge slope into the shoreline, the shoreline may need to be altered; the need for dredging and capping in the river may result in the need for integration into the higher shoreline for removal or capping of contaminants in the lower shoreline.

d It is assumed that the existing habitat condition will not be further improved or degraded if left in place regardless of the proposed remedial activity. For example, sheetpile and riprap in the active channel margin have a habitat value of 0. The proposed habitat value will remain 0 regardless of what remedial activity is proposed.

e Existing or proposed habitat values depend on the habitat characteristics where the piling or covering structures are or will be located.

f Value could change depending on the type of hardening that occurs. For this table, we assumed the slope would be riprapped.

g Value could change depending on proposed type of softening. For this table we assumed a slope < 5:1 with vegetation and no armoring.

h No existing values are found in the NMFS Expert Panel Table of Relative Chinook Salmon Lower Willamette Habitat Values for hardening off-channel habitats, so the values from the active channel margin were used (i.e., riprap = 0.0)

i It is assumed that the riprap and covering structures habitat will not be further improved or degraded by placing piling.

k NMFS Expert Panel provided a value of 0.1 for riprap in the shallow water main channel areas. Proposing to add a value of ranging from 0.4 to 0.6 for material sized larger than gravel, but smaller than riprap.

n Sand/silt/gravel = material less than 64 mm in size

o This scenario did not have a value in the Expert Panel table. As such, a value of 0.6 is proposed for this scenario.

p Value will vary depending on what the naturally vegetated habitat types will be hardened to (i.e., vegetated riprap or riprap) or on what the degraded habitat types are softened to.

General Note - For the purposes of the FS, it is assumed that mitigation projects would be implemented within 2 years of the remedial activity and that the mitigation project would create off-channel habitat, which would take 1 year to reach full function.

Table 1. Draft LWG Mitigation Framework[a] - Riparian Habitat

Remedial Technologies	Riparian													
	Naturally vegetated forest, <400 ft from ACM and in historic floodplain (0.65)	Note ID	Naturally vegetated forest, <400 ft from ACM (0.5)	Note ID	Naturally vegetated, grass/shrub and associated with historic flood plain (0.35)	Note ID	Naturally vegetated, grass/shrub (0.2)	Note ID	Invasive species (0.1 - 0.3)	Note ID	Vegetated Riprap (0.05 - 0.5)	Note ID	Unvegetated/paved/buildings/riprap (0)	Note ID
Dredging														
Dredging resulting in a habitat type conversion to deep water	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dredging **not** resulting in a habitat type conversion (may include capping back over the dredge area with similar substrate type)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capping														
Capping resulting in a **significant** change in substrate type (i.e., from silt/sand/gravel to large rock) but no change in depth zones [n]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capping resulting in a **moderate** change in substrate type (i.e., from silt/sand/gravel to cobble or material size larger than gravel but smaller than riprap) but no change in depth zones [n]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capping that **does not** result in a significant change in the substrate type (i.e., substrate size remains similar to existing conditions) and no change in depth zones	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capping that leads to a conversion of deep water to shallow water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock)[n]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capping that leads to a conversion of deep water to shallow water depths and **does not** result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Shoreline Integration[b]														
Shoreline integration resulting in hardening of the shoreline (i.e., placement of large rock)		p		p		p		p		p		-		-
Shoreline integration resulting in softening of the shoreline	N/A	-	N/A	-	N/A	-	N/A	-		p		p		p
Shoreline integration that **does not** result in a change in the shoreline condition		-		-		-		-		-		-		-
Enhanced Monitored Natural Recovery (includes in situ treatment)														
Placement of sand/gravel or smaller substrate for monitored natural recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Over-water and In-water Structures														
Removal of over-water structures that causes aquatic shading	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Replacement of over-water structures in a way that reduces the amount of aquatic shading by allowing light to penetrate underneath the structure and that is expected to improve habitat function	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Removal of existing piles that provide habitat to predators of juvenile salmonids	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 1. Draft LWG Mitigation Framework[a] - Riparian Habitat

Remedial Technologies	Riparian: Naturally vegetated forest, <400 ft from ACM and in historic floodplain (0.65)	Note ID	Naturally vegetated forest, <400 ft from ACM (0.5)	Note ID	Naturally vegetated, grass/shrub and associated with historic flood plain (0.35)	Note ID	Naturally vegetated, grass/shrub (0.2)	Note ID	Invasive species (0.1 - 0.3)	Note ID	Vegetated Riprap (0.05 - 0.5)	Note ID	Unvegetated/paved/buildings/riprap (0)	Note ID
Confined Disposal Facility Construction/Confined Aquatic Disposal														
Filling that leads to a conversion of deep water to shallower water depth zones and results in a significant change in substrate type (i.e., from silt/sand/ gravel to large rock) [n]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Filling that leads to a conversion of deep water to shallow water depths and does not result in a significant change in substrate type (i.e., from silt/sand/gravel to large rock) [n]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Filling aquatic habitat that results in a conversion to upland habitat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

a This matrix is focused on long-term habitat impacts rather than short-term construction related impacts.The short-term construction related impacts would be dealt with using BMPs that could potentially be employed, and would not require habitat mitigation.
b Shoreline Integration = To successfully integrate a new cap or dredge slope into the shoreline, the shoreline may need to be altered; the need for dredging and capping in the river may result in the need for integration into the higher shoreline for removal or capping of contaminants in the lower shoreline.
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h No existing values are found in the NMFS Expert Panel Table of Relative Chinook Salmon Lower Willamette Habitat Values for hardening off-channel habitats, so the values from the active channel margin were used (i.e., riprap = 0.1)
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n Sand/silt/gravel = material less than 64 mm in size
o This scenario did not have a value in the Expert Panel table.
p Value will vary depending on what the naturally vegetated habitat types will be hardened to (i.e., vegetated riprap or riprap) or on what the degraded habitat types are softened to.
General Note - For the purposes of the FS, it is assumed that mitigation projects would be implemented within 2 years of the remedial activity and that the mitigation project would create off-channel habitat, which would take 1 year to reach full function.